

CLAIMS

1. A method for providing refrigeration to a refrigeration load comprising:

(A) generating refrigeration and using the refrigeration to condense working fluid;

(B) passing the condensed working fluid into an evaporator comprising a porous wick having a surface, providing a refrigeration load to the evaporator, flowing condensed working fluid onto the wick surface, and evaporating condensed working fluid from the wick surface to provide refrigeration to the refrigeration load and to generate a capillary pumping force; and

(C) withdrawing evaporated working fluid from the evaporator, wherein the condensed working fluid is passed to the evaporator at least in part by the capillary pumping force from the evaporation of the condensed working fluid from the wick surface.

2. The method of claim 1 wherein the working fluid comprises nitrogen.

3. The method of claim 1 wherein the refrigeration is generated using a cryocooler.

4. The method of claim 1 wherein the condensed working fluid is subcooled prior to entering the evaporator.

5. The method of claim 1 wherein the condensed working fluid is passed to the evaporator in part by gravitational force.

6. The method of claim 1 further comprising passing liquid cryogen from a reservoir to the evaporator.

7. The method of claim 1 wherein the porous wick comprises metal.

8. The method of claim 7 wherein the porous wick comprises metal foam.

9. The method of claim 1 wherein the evaporator is a plate-fin heat exchanger comprising a plurality of fins and heat from the refrigeration load is provided through the fins to the porous wick.

10. The method of claim 1 wherein the porous wick comprises a plurality of pores each having a diameter less than 0.5 millimeter.

11. A method for providing refrigeration to a refrigeration load comprising:

(A) generating refrigeration and using the refrigeration to condense working fluid;

(B) providing refrigeration from the condensed working fluid to the refrigeration load and thereafter passing the condensed working fluid into an evaporator comprising a porous wick having a surface, flowing condensed working fluid onto the wick surface,

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and evaporating condensed working fluid from the wick surface to generate a capillary pumping force; and

(C) withdrawing evaporated working fluid from the evaporator, wherein the condensed working fluid is passed to the evaporator at least in part by the capillary pumping force from the evaporation of the condensed working fluid from the wick surface.

12. The method of claim 11 wherein the condensed working fluid is evaporated in the evaporator by heat provided by an electric heater.

13. The method of claim 11 wherein the working fluid comprises nitrogen.

14. The method of claim 11 wherein the refrigeration is generated using a cryocooler.

15. The method of claim 11 wherein the condensed working fluid is subcooled prior to entering the evaporator.

16. The method of claim 11 further comprising passing liquid cryogen from a reservoir to the evaporator.

17. The method of claim 11 wherein the porous wick comprises metal.

18. The method of claim 17 wherein the porous wick comprises metal foam.

19. The method of claim 12 wherein the evaporator is a plate-fin heat exchanger comprising a plurality of fins and heat from the electric heater is provided through the fins to the porous wick.

20. The method of claim 11 wherein the porous wick comprises a plurality of pores each having a diameter less than 0.5 millimeter.